

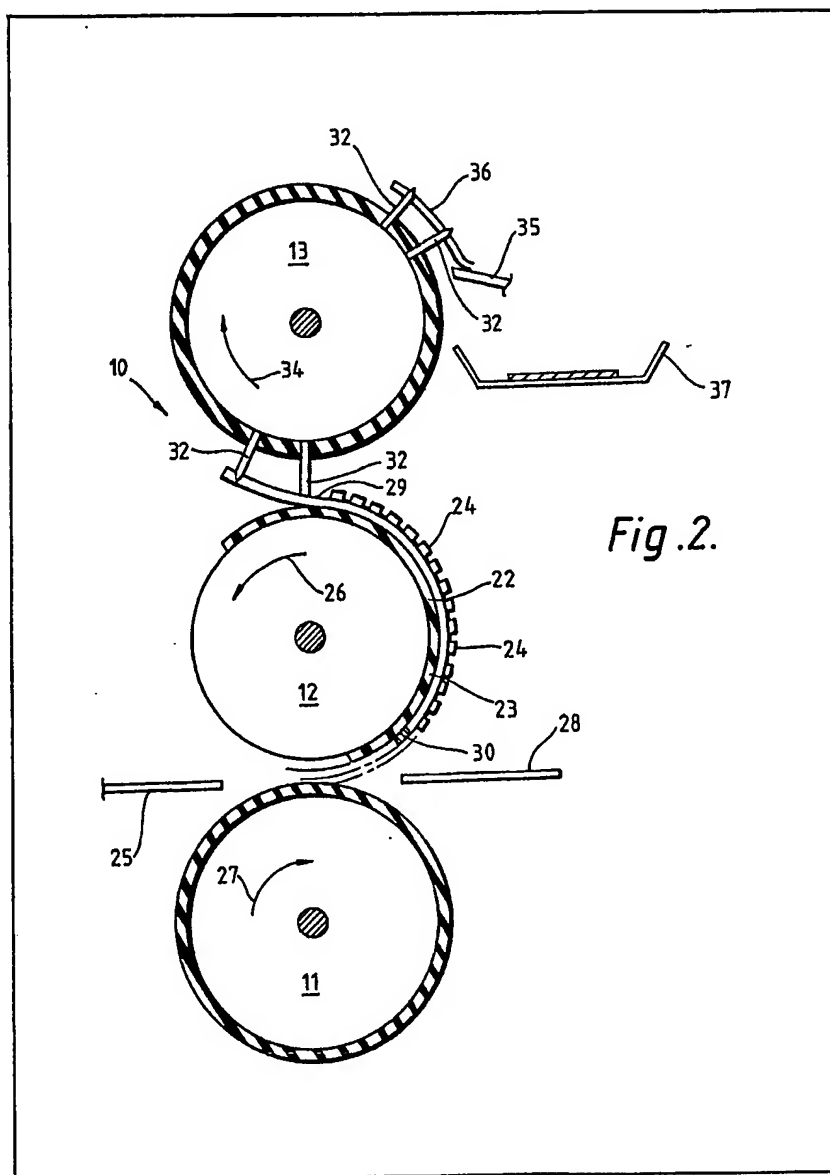
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(54) A stripping device for removing waste material

(57) A stripping device for removing waste sheet material from the vicinity of a rotary cutting die (22) mounted on a rotatable drum (12) includes a plurality of pins (32) mounted on a rotatable drum (13) and positioned adjacent to the cutting die (22). The

die (22) includes knives (24) for cutting a sheet of material into a desired configuration with the waste portions (29, 30, 36) of the sheet (25) remaining wedged on the die (22). The stripper pins (32) pierce and lift the waste portions (29) of the sheet (25) away from the die (22), and the waste portions (36) are subsequently removed by plates (35).



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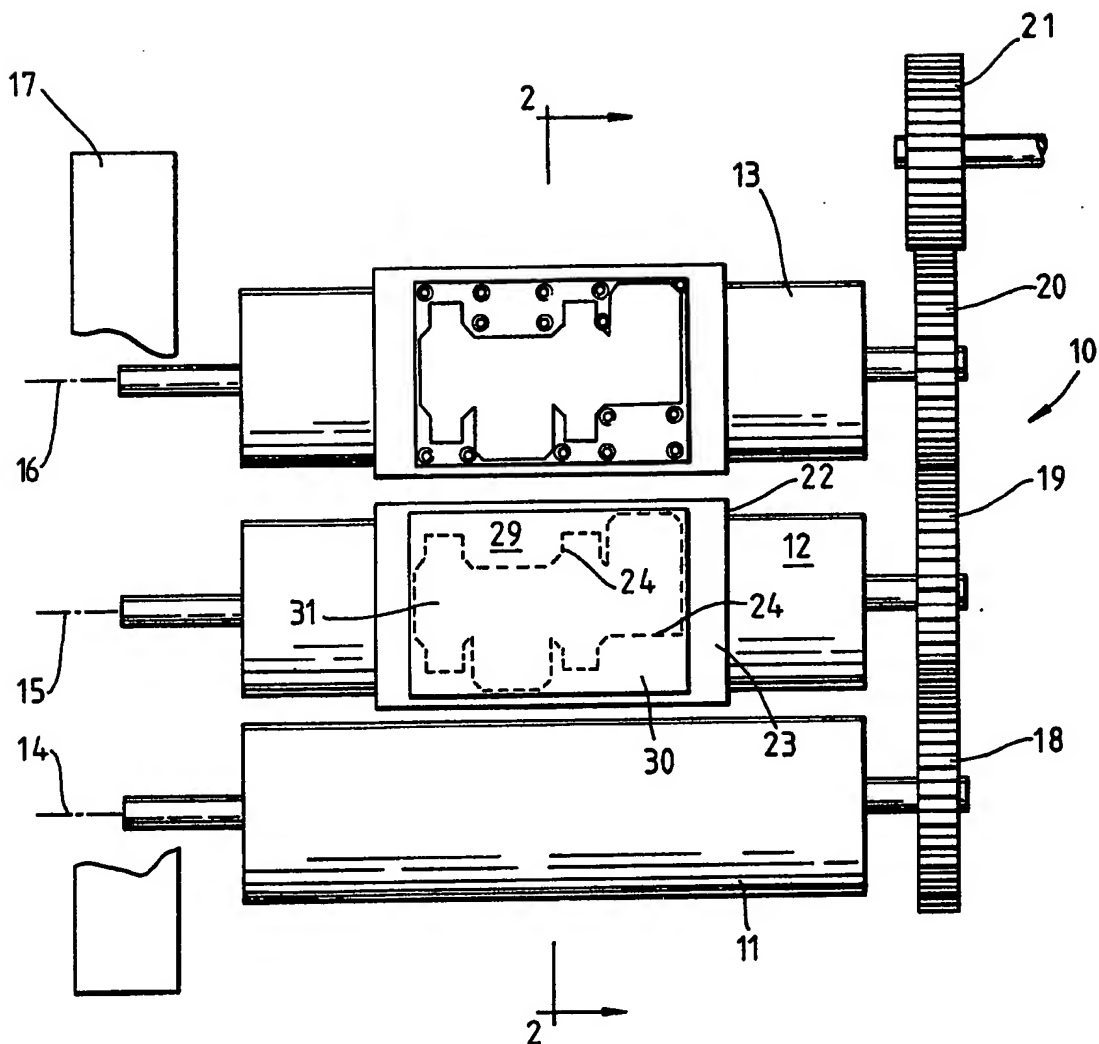


Fig .1.

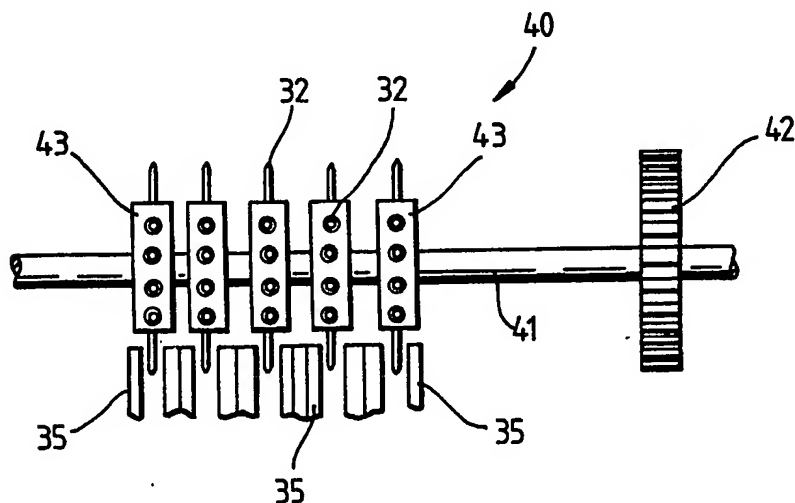
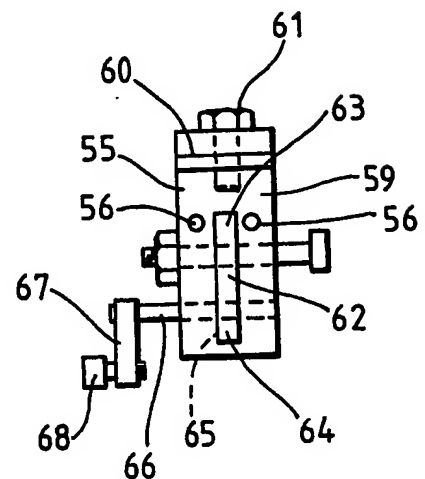
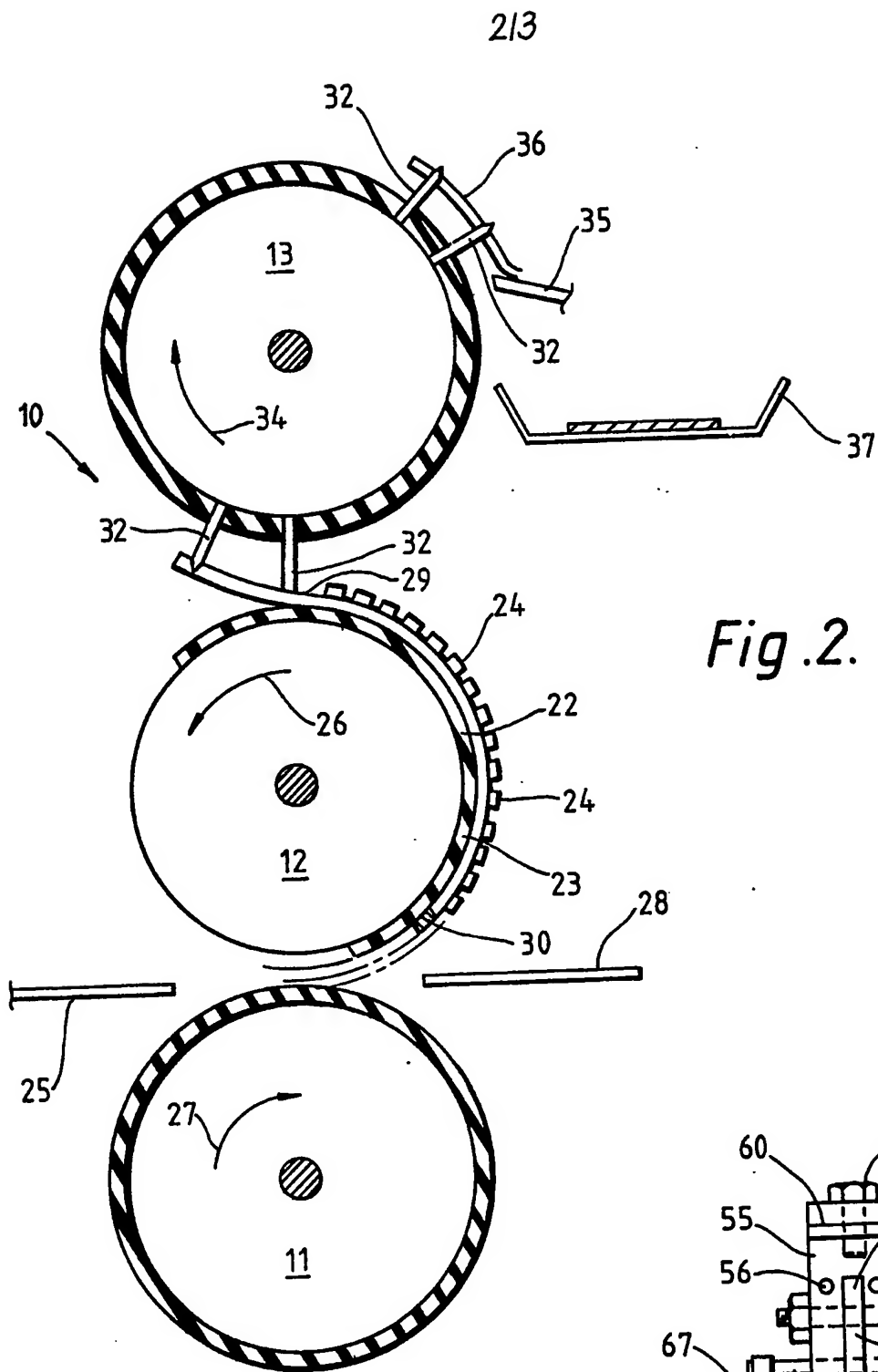


Fig .3.

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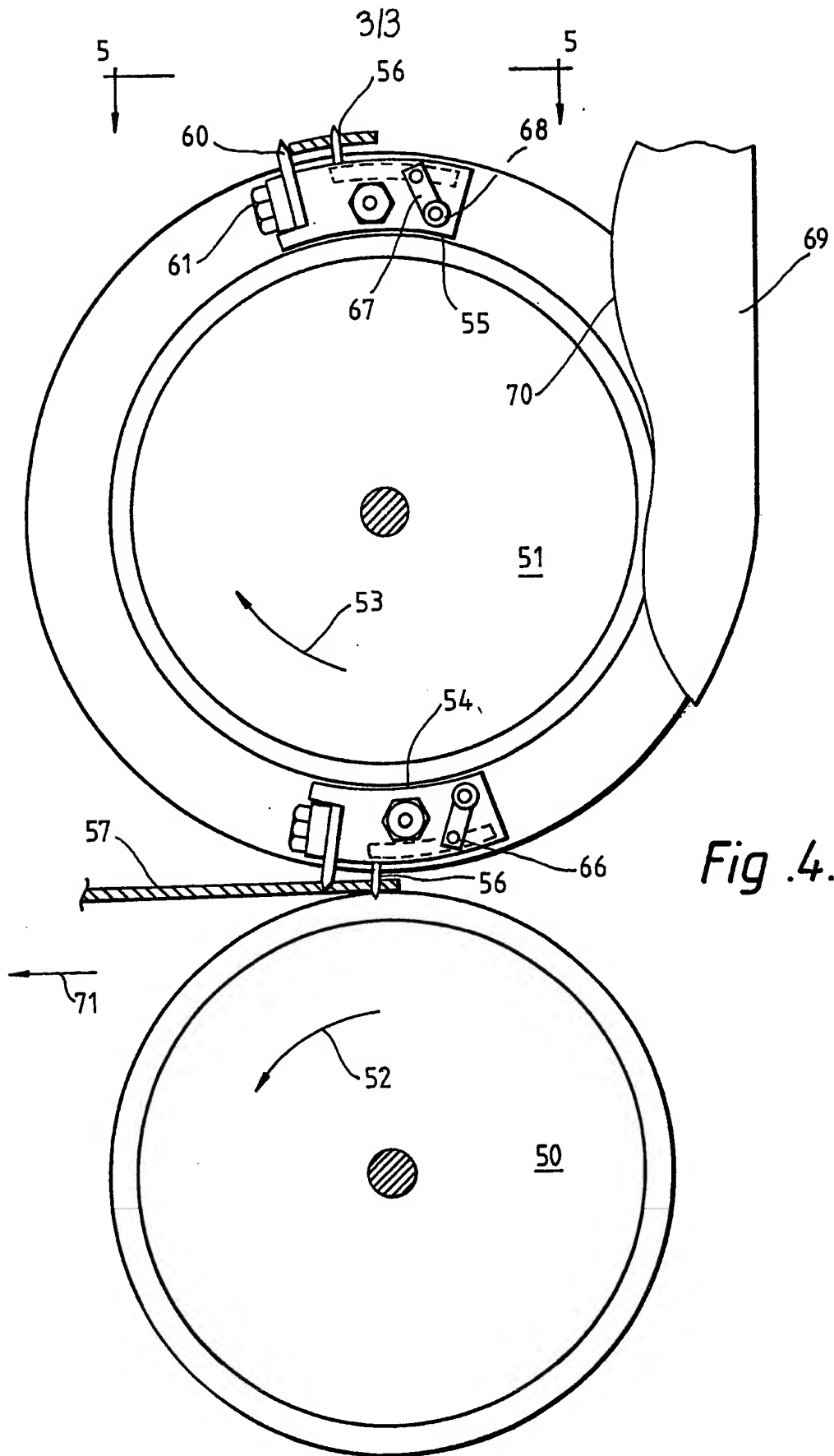


Fig .4.

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SPECIFICATION

Stripping device for removing waste sheet board

A variety of devices for cutting blanks from sheet board and then separating the scrap or waste sheet from the blanks are known. Typically, steel rule cutting dies are constructed to eject both the finished cut product and the waste material simultaneously at the moment of cutting.

Stripping machines for removing waste material from the cut sheet are known. For example, in U.S. Patent No. 3,643,553, there is disclosed a stripping machine wherein a plurality of rotatably mounted pins are forced into the waste portion to be cut from the cardboard sheet. Similar machines are disclosed in U.S. Patent Nos. 3,391,589, 3,877,353 and 4,031,816.

According to the present invention, there is provided a stripping device for removing waste sheet wedged in a sheet cutting die rotatable about an axis, which device comprises a stripping pin holder rotatably mounted on a frame and having an axis of rotation extending in the same direction and parallel to said axis of said cutting die; a plurality of stripping pins mounted on said holder and extending therefrom, said pins being positionable adjacent to said cutting die as said holder rotates to extend into said cutting die thereby piercing said waste sheet and removing said waste sheet from said cutting die upon continued rotation of said cutting die and said holder; and means operably engaged with said holder to rotate said holder in synchronization with said cutting die.

The present invention also provides a rotary die cutter provided with a stripping device, wherein said rotary die cutter comprises a first drum and a second drum with parallel axes of rotation, said first drum having a sheet cutting die means mounted thereon movable past said second drum, said die means including cutting edges separating said die means into a product-forming portion and a waste sheet-forming portion and operable to cut a sheet of material passing between said first drum and said second drum; wherein said stripping device comprises a stripping holder rotatably mounted adjacent to said first drum and having a parallel axis of rotation, said stripping holder having a plurality of stripping pins mounted thereto and extending therefrom into said waste sheet-forming portion of said die to pierce and remove sheet material located therein; and wherein there is provided drive means engaged with said first drum, said second drum and said stripping holder and operable to rotate said first drum in a direction opposite said second drum and said stripping holder to move said stripping pins into and out of said waste sheet-forming portion of said die means.

The present invention further provides a rotary cutter provided with a stripper, comprising a first rotatably mounted drum with an outer circumferentially extending sheet-supporting surface; a second rotatably mounted drum with an

axis of rotation parallel to said first drum and including a knife edge to cut a sheet of material moving between said first drum and second drum into a product portion and a waste portion; drive means operable engaged with said first drum and said second drum and operable to rotate said second drum in a direction opposite the rotation of said first drum; stripper pin means mounted adjacent to said second drum and extending into said waste portion as said pin is moved past said second drum; and second means operable to remove said waste portion from said pin means.

The present invention further provides an apparatus comprising a holder and a plurality of stripping pin means mounted thereto and operable to remove waste sheet material from a rotary cutting die mounted adjacent to said holder.

For a better understanding of the invention, reference will now be made, by way of example, to the accompanying drawings in which:

Figure 1 is a fragmentary plan view of a rotary steel rule cutting die provided with a stripper in accordance with the present invention;

Figure 2 is an enlarged cross-sectional view taken along line 2—2 and viewed in the direction of the arrows, showing the middle and top drums rotated to depict the removal of waste material by stripping pins;

Figure 3 is a fragmentary side view of an alternative embodiment of the stripping device;

Figure 4 is a cross-sectional view of a stitch-glue lap head with a cross-cut holder including a stripper; and

Figure 5 is a fragmentary top view of the stripping device shown in Figure 4, looking in the direction of arrows 5—5.

Referring to Figures 1 and 2, there is shown as apparatus 10 including a rotary steel rule cutting die 22 constructed in such a manner as to eject only the finished product and to wedge the waste material between the steel rule cutting knives and to then subsequently eject the waste material by means of a stripper. Apparatus 10 includes three cylindrical drums 11, 12 and 13 having respectively parallel but spaced apart axes of rotation 14, 15 and 16. Each cylindrical drum has a drive shaft bearingly received and supported at its opposite ends by a suitable frame 17. Meshing sprocket gears 18—20 are respectively provided at one end of each drive shaft for drums 11, 12 and 13 and are driven by a suitable drive means 21 of conventional construction. Thus, each cylindrical drum rotates in synchronization and at the same angular speed.

Drum 12 includes the rotary steel rule cutting die 22 mounted on its circumference and extending at least partially therearound. Die 22 includes a base plate 23 affixed to the drum with a plurality of upstanding cutting knives 24 mounted on base plate 23 and extending radially outward therefrom. The cutting knives are arranged in a pattern providing for the final cut sheet. The bottom drum 11 is spaced apart from drum 12 a sufficient distance to allow an uncut sheet 25 to be conveyed between drums 11 and 12 with the

drums being sufficiently close to enable knives 24 to cut sheet 25 as the drums are rotated in opposite directions as shown in Figure 2 by arrows 26 and 27. Once the incoming sheet 25

5 has been cut by knives 24, the cut sheet will pass completely between and from drums 11 and 12 with the final cut product represented by sheet 28 in Figure 2 and with the remaining portion or waste material of sheet 25 remaining upon die 22 as represented by waste portions 29 and 30. Cutting knives 24 are arranged to define and form two separate portions of the sheet of material, namely the desired final configuration 31 (Figure 1) and the waste portions 29 and 30 wedged between knives 24 and temporarily stuck on the die.

The waste material to be ejected from the die is removed from its wedged position between the steel rule cutting knives by a plurality of stripping pins 32 mounted to the third drum or stripping pin holder 13. Stripping pins 32 are attached to a suitable base in turn attached to cylindrical drum 13. The pins 32 and mounting base along with drum 13 are combined to form a stripping die rotated in the direction of arrow 34 opposite to the rotational direction of drum 12. Stripping pins 32 are attached to drum 13 at the desired location across the width and around the circumference of the drum to mate with the various waste material configurations formed by the steel rule cutting knives 24. As drum 13 is rotated, stripping pins 32 will come into contact with waste portion 29 eventually piercing waste portion 29 and then applying a forward and lifting pressure to the waste material removing the waste material from die 22 and carrying the waste material to a disposal location.

The length of stripping pins 32 is particularly critical to the satisfactory operation of the stripping device. More specifically, the radial distance from axis 16 to the outermost extremities of stripping pins 32 must exceed the radial distance from axis 15 to the steel rule cutting knives. Since both drums 12 and 13 are rotating at the same angular speed, the greater radial distance of pins 32 provides a greater surface speed of the stripping pins as compared to the surface speed of the steel rule cutting knives thereby permitting the tips of the stripping pins to exert pressure against waste material 29 to be ejected from its wedged position between the steel rule cutting knives. The pressure of the tips of the stripping pins 32 against the waste material to be ejected, creates a lifting action at the moment of separation as the stripping device and the rotary steel rule cutting die continues to rotate through 360°.

The waste material clings to the stripping pins as the stripping device or holder 13 rotates. The waste material is removed from the stripping pins by means of stripping plates 35 placed laterally across the width of the stripping device in close proximity to the rows of stripping pins. The stripping plates are supported through 360° of rotation of the drum 13 by a base which extends

around the circumference of drum 13. Plates 35 strip the waste material 36 to be ejected from drum 13 and deposit such material in a disposal conveyance 37.

70 Another stripping device 40 is shown in Figure 3. Stripping device 40 includes a shaft 41 rotatably mounted in a manner identical to the mounting of the drum 13 previously described with one end of shaft 41 having a sprocket gear 42 mounted thereon in meshing engagement with sprocket gear 19 attached to drum 12. Thus, shaft 41 has an axis of rotation parallel to axis 15. The drum 13 is merely removed and replaced with stripping device 40 and operates in the manner identical to that previously described for the apparatus shown in Figure 1.

Laterally movable hubs 43 are mounted on shaft 41 with stripping pins 32 in turn mounted on hubs 43 in the desired locations to remove the waste sheet material from die 23. The stripping pins may be inserted around the periphery of hubs 43 to mate with the cut-out configurations described by the steel rule cutting knives and the rotary steel rule cutting die. Such stripping pins may be of varying lengths, permitting a variation in surface speed of their tips during the rotation of the stripping device. A plurality of stripping plates 25 identical to those shown in Figure 2 are provided adjacent to the rotating stripping pins 32 upon hubs 43 to position plates 35 between the movable hubs. The stripping plates force the waste sheet material to be ejected from the stripping pins and deposit such material in a disposal conveyance identical to conveyance 37. Hubs 43 may be mounted on shaft 41 in a number of conventional constructions.

A modification to the stripping device as it pertains to a cross-cut, stitch-glue lap holder is shown in Figure 4. This device is used for controlling and ejecting the waste sheet material which occurs at printer slotters and flexographic folder-glueers. Drums 50 and 51 are rotatably mounted and bearingly supported by a suitable frame having parallel axes of rotation with drum 50 rotating in the direction of arrow 52 and drum 51 rotating in the direction of arrow 53. A left-hand cross-cut holder 54 and a right-hand cross-cut holder 55 are attached to a conventional stitch-glue lap head formed by drum 51. A plurality of stripping pins 56 are attached to holders 54 and 55 to penetrate the waste portion of a sheet of material 57 passing between the two drums.

Holder 55 will now be described with particular reference to Figure 5, it being understood that a similar description applies to holder 54. Holder 55 includes a main body or block 59 fixedly attached to drum 51 by conventional fastening devices. A cross-cut knife 60 is attached to block 59 by a conventional fastener 61. Likewise, stripping pins 56 are fixedly secured to block 59 and extend radially outward from drum 51. A spring-biased lever or arm 62 extends between the pair of stripping pins 56 and includes a pair of ends 63 and 64 with the lever or arm normally being

recessed within block 59. A helical spring 65 is seated within a recess block 59 and is in contact with lever 62 to normally urge end 63 of the lever to a recessed position with the lever being

5 pivotally mounted by fastener 66 in turn having an outwardly extending and fixedly attached to arm 67 having a roller 68 mounted offset from fastener 66. An external member 69 is spaced

10 apart from, but positioned near, drum 51 and has a cam or control surface 70 positioned to engage roller 68 as the roller is moved past member 69 as drum 51 is rotated. Cam surface 70 defines a path causing roller 68 to pivot along with arm 67 in a clockwise direction, as viewed in Figure 4 thereby

15 causing end 63 of lever 62 to move outwardly past the tips of stripping pins 56 thereby forcing the waste portion clinging to the stripping pins away from the pins and into a suitable disposal conveyance, not shown, similar to conveyance 37.

20 Thus, the end product of sheet 57 is conveyed away from the drums in a direction of arrow 71 whereas the waste portion continues to move in a direction of arrow 53 clinging to the stripping pins until removed therefrom by the pivoting lever.

25 The stripping devices described above with reference to the drawings provide control of ejected material to prevent it from interleaving with the finished product. The control of ejected material will prevent contamination of inking

30 systems, provide a safe, clean machine operation and significantly improve productivity. The stripping devices remove the waste material from its wedged position in the steel rule cutting dies in a controlled manner at the desired time and

35 location as the device rotates through 360° of travel. Power to rotate the stripping devices may be supplied from the rotary die cutter or from an external source. Separate stripping dies may be provided for mating with each cutting die to

40 facilitate fast attachment to the stripping device thereby significantly reducing set-up time. The stripping devices reduce the necessity for the normal precision with which rotary steel cutting dies are constructed thereby reducing the costs.

45 Cutting will be greatly facilitated by wedging the material to be ejected in the rotary cutting die while the finished product travels through a different plane, thereby achieving a positive separation of the finished product from the

50 material to be ejected. Lower cutting pressures will be possible with resultant longer cutting anvil life and longer cutting die life.

CLAIMS

1. A stripping device for removing waste sheet

55 wedged in a sheet cutting die rotatable about an axis, which device comprises a stripping pin holder rotatably mounted on a frame and having an axis of rotation extending in the same direction and parallel to said axis of said cutting die; a plurality

60 of stripping pins mounted on said holder and extending therefrom, said pins being positionable adjacent to said cutting die as said holder rotates to extend into said cutting die thereby piercing said waste sheet and removing said waste sheet

65 from said cutting die upon continued rotation of said cutting die and said holder; and means operably engaged with said holder to rotate said holder in synchronization with said cutting die.

2. A stripping device as claimed in claim 1, further comprising ejector means operable to force waste material sheet away from said pins once said pins are rotated away from said cutting die.

3. A stripping device as claimed in claim 2, wherein said ejector means comprises an elongated member with a free edge positioned next to said holder but spaced axially from said pins to pry said waste sheet material from said pins as said holder rotates said pins past said elongated member.

4. A stripping device as claimed in any of claims 1 to 3, wherein said holder comprises a cylindrical main body, and wherein said pins project externally of said main body.

5. A stripping device as claimed in any of claims 1 to 3, wherein said holder comprises a shaft and a plurality of axially aligned cylindrical main bodies mounted on said shaft and axially movable thereon, and wherein said pins are mounted on said main bodies.

6. A rotary die cutter provided with a stripping device, wherein said rotary die cutter comprises a first drum and a second drum with parallel axes of rotation, said first drum having a sheet cutting die means mounted thereon movable past said

95 second drum, said die means including cutting edges separating said die means into a product-forming portion and a waste sheet-forming portion and operable to cut a sheet of material passing between said first drum and said second drum; wherein said stripping device comprises a

100 stripping holder rotatably mounted adjacent to said first drum and having a parallel axis of rotation, said stripping holder having a plurality of stripping pins mounted thereto and extending therefrom into said waste sheet-forming portion of said die to pierce and remove sheet material located therein; and wherein there is provided drive means engaged with said first drum, said

105 second drum and said stripping holder and operable to rotate said first drum in a direction opposite said second drum and said stripping holder to move said stripping pins into and out of said waste sheet-forming portion of said die means.

7. A rotary die cutter as claimed in claim 6, further comprising ejector means operable to remove sheet material from said pins as said stripping holder is rotated with said pins past said ejector means.

8. A rotary die cutter as claimed in claim 6 or 7, wherein said stripping holder comprises a drive shaft with a plurality of axially shiftable hubs mounted thereto, and wherein said pins are mounted on said hubs.

9. A rotary cutter provided with a stripper, comprising a first rotatably mounted drum with an outer circumferentially extending sheet-supporting surface; a second rotatably mounted drum with an axis of rotation parallel to said first drum and

including a knife edge to cut a sheet of material moving between said first drum and second drum into a product portion and a waste portion; drive means operable engaged with said first drum and said second drum and operable to rotate said second drum in a direction opposite the rotation of said first drum; stripper pin means mounted adjacent to said second drum and extending into said waste portion as said pin is moved past said second drum; and second means operable to remove said waste portion from said pin means.

10. A rotary cutter as claimed in claim 9, wherein said second means comprises a control surface spaced apart from said second drum and an arm and actuator movably mounted on said second drum, said arm having an outer end normally positioned inwardly of said pin but movable by said actuator against the waste portion on said pin as said actuator is moved against said control surface as said second drum is rotated.

11. A rotary cutter as claimed in claim 9 or 10, wherein said stripper pin means comprises a plurality of pins movably mounted about an axis parallel to said axis of rotation of said second rotatably mounted drum.

12. An apparatus comprising a holder and a plurality of stripping pin means mounted thereto and operable to remove waste sheet material from a rotary cutting die mounted adjacent to said holder.

13. An apparatus is claimed in claim 12, wherein said holder is cylindrically shaped.

14. An apparatus as claimed in claim 12 or 13, wherein said stripping pin means comprises pins

adjustably mounted on said holder to extend therefrom over variable lengths.

15. An apparatus as claimed in claim 14, comprising a rotatably mounted rotary cutting die with steel rule cutting knives, said stripping pins being mounted on said holder to mate with configurations described by said knives, and said stripping pins being able to penetrate waste sheet wedged in said configurations in said die and to lift said waste sheet from said die as said die moves apart from said pins.

16. An apparatus as claimed in claim 15, further comprising drive means engaged with said holder and said die operable to rotate said holder in synchronization with said die, said holder having a first axis of rotation and a plurality of laterally-movable hubs upon which are mounted said pins with outer ends located a first direction from said first axis, said die having a second axis of rotation parallel to said first axis with said knives located a second distance from said second axis and with said first distance being greater than said second distance providing a greater surface speed of said outer ends as opposed to said knives forcing said waste sheet forward and away from said die.

17. A stripping device substantially as hereinbefore described with reference to, and as shown in, Figures 1 and 2, Figure 3, or Figures 4 and 5 of the accompanying drawings.

18. A rotary cutter and stripping device, substantially as hereinbefore described with reference to, and as shown in, Figures 1 and 2, Figures 1 and 2 as modified by Figure 3, or Figures 4 and 5 of the accompanying drawings.